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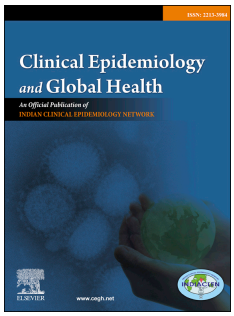

Patient safety culture assessment in Iran using the "Hospital survey on patient safety culture" tool: A systematic review and meta-analysis

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Patient safety culture assessment in Iran using the "Hospital survey on patient safety culture" tool: A systematic review and meta-analysis

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Abstract

Background:

Paying attention to patient safety is a crucial aspect of the healthcare provision delivery. Integrating and coordinating the different parts of the health system can ensure a safe, high-quality and efficient care. Patient safety culture (PSC) is a broad, complex and multi-dimensional conceptual framework. In recent years, several studies have been conducted to evaluate PSC using the "Hospital Survey on Patient Safety Culture" (HSOPSC) tool. The aim of this study was to examine the level of PSC in Iranian hospitals.

Methods:

ISI/Web of Sciences (WoS), PubMed/MEDLINE, Embase, CINAHL, PsychINFO and Scopus as well as Iranian databases including MagIran and SID were searched from January 2000 to July 2018. The Newcastle-Ottawa Scale checklist was used to assess the quality of the studies. The mean score of the participants' responses for each dimension of the questionnaire was calculated using the DerSimonian-Laird's random model with a 95% confidence interval.

Results:

In the current systematic review and meta-analysis, 27 studies conducted between 2012 and 2017 were included. The participants were 9,264. Low scores (in the range 37.79-65.43) were found, especially when compared to other countries such as Lebanon, Turkey and the USA.

Conclusion:

Our results showed that in Iran the level of PSC is low and requires special attention from healthcare managers and providers. PSC should be a very important priority in Iran's health sector. Health decision- and policy-makers should pay particular attention to offering training programs to promote and develop PSC.

Keywords: Patient safety culture, Iran, hospital survey on patient safety culture, systematic review, meta-analysis

Background

Paying attention to patient safety is a crucial aspect of the healthcare provision delivery. Nowadays, in advanced countries, measuring this indicator is of high interest for the healthcare providers to make evidence-based decision and implement adequate plans and programs [1]. Properly integrating and coordinating the different parts of the health system can ensure a safe, efficient and high-quality healthcare [2]. Patient safety culture (PSC) is a broad, complex and multi-dimensional conceptual framework [3], which enables to assess the behavior of individuals and organizations based on shared beliefs and values. The ultimate goal of PSC is to reduce injuries and increase patient safety [4]. In presence of high safety standards, errors are less likely to occur, and, when they occur, are promptly reported [5, 6].

Deaths due to unwanted but avoidable accidents has led hospital managers to consider PSC as their top priority [7, 8]. Different healthcare organizations, including hospitals and other healthcare centers, are working to provide an appropriate assessment of PSC in order to improve patient safety-related procedures [9]. Unfortunately, despite the relevant damage caused by insecure care, there is little evidence of the role and effect of PSC in developing countries, and therefore, these countries do not have a good understanding of the patient's safety status in their hospitals [10, 11].

The “Hospital Survey on Patient Safety Culture" (HSOPSC) developed by the Agency for Healthcare Research and Quality (AHRQ) can be used to assess PSC [12]. HSOPSC is a validated, reliable tool, which comprises of 12 dimensions and 42 questions. It is psychometrically sound, and confirmed by extensive analyses including item analysis, reliability assessment, inter-correlation, exploratory and confirmatory factor analysis [13-15]. This tool has been translated into different languages and is used in several countries. It can help healthcare managers, policy- and decision-makers design *ad hoc* interventions and measures.

Iran is one of the developing countries that offers widespread hospital services, whose safety levels and standards need to be monitored by healthcare decision- and policy-makers, in order to improve and enhance the level of PSC in the country. In recent years, several studies have been conducted to evaluate PSC utilizing the HSOPSC tool. The aim of this study was to examine the level of PSC in Iranian hospitals through a systematic review and meta-analysis of the published investigations.

Methods

Search strategy

The present study was based on the “Preferred Reporting Items for Systematic Reviews and Meta-Analyses” (PRISMA) guidelines [16], reported in **Appendix 1**. International scholarly databases such as ISI/Web of Sciences (WoS), PubMed/MEDLINE, Embase, CINAHL, PsychINFO and Scopus as well as Iranian databases including MagIran and SID were searched from January 2000 to July 2018. The following search strategy was used: (“Patients safety culture” OR “Patient culture” OR “PSC” OR “Patient safety” OR “Safety” OR “Hospital safety” OR “Safety climate” OR “Hospital survey”) AND (“Hospital” OR “Government hospital” OR

"Private hospital" OR "Teaching hospital") AND ("Hospital Survey on Patient Safety Culture" OR "HSOPSC") AND ("Iran"). Also, each reference list of the included studies was hand-searched for getting more relevant studies and reducing the risk of missing potentially eligible investigations.

Inclusion and exclusion criteria

We included studies that: i) used the HSOPSC tool for PSC evaluation, ii) were published either in Persian or English, and iii) were conducted in hospitals. We excluded studies that: i) used a tool other than HSOPSC, ii) were carried out outside of hospitals and healthcare centers and iii) did not fully report the 12 dimensions of the instrument.

Data extraction

Two authors independently extracted relevant study data and information, including the surname name of the first author, the year of publication, the city of the study, the number and type of participants, and the scores for the items in the questionnaire. Disagreements between the two authors were resolved through discussion.

Quality assessment

The Newcastle-Ottawa Scale (NOS) checklist was used to critically appraise the quality of the retained studies. This checklist assesses 3 domains (namely, selection, comparability and outcomes). Evaluation of the quality of studies is reported in the **Appendix 2.**

Data analysis

The mean score of the participants' responses for each dimension of the questionnaire was calculated using the DerSimonian-Laird's random model with a 95% confidence interval (CI) [17]. To evaluate heterogeneity among included studies, I^2 test was used [18]. Egger's linear regression test was used to evaluate the publication bias [19]. Sensitivity analysis was also performed to ensure the stability of the results for all the dimensions of the questionnaire [20]. All statistical significances were set at p-values less than 0.05. All data were analyzed using the commercial software STATA Ver.14 (Stata Corp, College Station, TX, USA).

Results

The process of searching and selecting proper studies is pictorially represented in **Figure 1**. In the initial search, 176 studies were found and, after the removal of duplicates, 97 of them were retained. At this stage, 35 studies were selected based on title and/or abstract review and the removal of irrelevant studies. The full text of these 35 studies was reviewed in depth and, in the end, 27 studies were deemed eligible for inclusion in the present systematic review and meta-analysis [21-47].

Studies were conducted between 2012 and 2017. Participants were 9,264. The main characteristics of the selected studies are shown in **Table 1**.

The mean of the responses of the 12 dimensions of the HSPSC tool is given in **Table 2** and **Appendix 3**. More in detail, higher scores were reported for the dimension of "organizational learning and continuous improvement" (mean 65.43), whereas lower scores for the dimension of "non-punitive response to error" (mean 37.79).

Sensitivity-analysis was performed. Before and after the sensitivity analysis, results did not change and confirmed the stability of the findings. Publication bias assessment was also performed by the Egger's linear regression test, and results showed that there was no evidence of publication bias. The results of the 12 dimensions of this tool in Iran, compared to other countries such as the USA [48], Lebanon [49], Ethiopia [50] and Turkey [51], are presented in **Figure 2**. The mean of reporting events in the included studies is shown in **Table 3.** The results of mean of reporting events in Iran, compared to other countries like the USA [48], Lebanon [49], and Ethiopia [50], are presented in **Figure 3**. The mean of graded responses is reported in **Table 4.** These results compared to other countries like the USA [48], Lebanon [49], Ethiopia [50] and Turkey [51] are shown in **Figure 4**.

Discussion

One of the challenges faced by the healthcare sectors and systems in both developed and developing countries is to increase the level of PSC. Health service providers are trying to create a good environment for the staff in order to make them properly understand and apply this crucial concept [52]. Assessing the status of PSC helps the organization become aware of the different aspects of patient safety that require serious attention. It also enables hospitals and healthcare providers to identify the strengths and weaknesses of their organizational culture in terms of patient safety and existing problems in this area [49]. Health policy- and decision-makers in Iran should work to create a just and proper culture in the workplace and encourage healthcare workers to report incidents, events and mistakes. Health policy- and decision-makers need to consider PSC as a serious concern and to try to correct the culture of blame and punishment. They should encourage organizations to continually improve PSC-related processes and procedures.

Our results showed that the means of the responses for the different dimensions of the questionnaire ranged from 37.79 to 65.43. The dimension's scores measured in this study are low compared to the results of studies conducted in other countries, such as the USA, Lebanon and Turkey, which emphasizes that the concepts of PSC are unknown to many Iranian hospitals' staff members and managers.

Our findings concerning mean scores of the non-punitive response to error dimension are consistent with Al Ahmadi's study in Saudi Arabia [53], Chen's study in Taiwan [54] and Al-Mandhari's study in Oman [55]. Non-punitive response to error is a very important factor that enables errors to be early detected and reported, contributing to their decreasing trend [56]. Many Iranian staff members in hospitals tend to under-report errors, being afraid of the consequences and being worried about punitive policies [57]. In many Iranian health service centers, punishing workers who commit mistakes is considered the easiest option by managers

and providers, without paying attention to the root causes of errors. It seems to be a major challenge in organizations such as hospitals to promote a continuous learning and promotion environment. A systematic approach in dealing with errors in organizations can create a positive safety culture that discourages managers from taking punitive action [58]. For this reason, the American health association has recommended that organizations should reject punitive culture, putting aside mistakes caused by personnel and individual failures, and transforming mistakes in learning opportunities.

The highest level of accountability in this study regards the organizational learning and continuous improvement dimension, which is consistent with the studies done in Saudi Arabia [53], Lebanon [49] and Oman [55].

Improving PSC requires the development of adequate training programs focused on the concepts of PSC to instruct all the staff members of an organization. Furthermore, this process should be performed on a regular basis, in order to be properly monitored and improved. Organizations that provide ongoing training on this issue for their employees are, indeed, successful and with a very low rate of errors and mistakes. Accreditation and clinical governance policy can play a positive role in promoting PSC [59]. In recent years, health managers, decision- and policy-makers in Iran have begun to pay special attention to hospital accreditation, and this has had a very positive impact on PSC [60], even though there is room for further improvement and standards are still not completely satisfactory.

Regarding the error reporting, our study results show that compared to other countries the staff members of Iranian hospitals tend to under-report errors. A qualitative study has shown that fear of being punished by managers, high workload, being subjected to personal accountability, and misuse of the report, are among the main determinants for this under-reporting [61].

In this regard, the staff members' trust and confidence towards healthcare managers and providers, and the assurance of a proper and not punitive treatment can lead to an early discovering and reporting of errors, ultimately making efforts to find and mitigate/counteract their causes and consequences.

Despite its methodological rigor, this study suffers from some limitations, which include: a) the high observed heterogeneity, which can be due to methodological differences among selected studies; b) the lack of data concerning many hospitals in Iranian provinces, which have not performed so far any safety assessment of PSC; and c) the dearth of information concerning groups different from nurses, such as hospital managers, physicians and specialists. which has made it impossible to specifically assess PSC among different groups.

Conclusion

The present study was conducted to investigate the status of PSC in Iranian hospitals. Results showed that the level of PSC is low and requires special attention from healthcare managers and providers. PSC should be a very important priority for Iran's health sector. Health decision-and

policy-makers should pay particular attention to offering training programs in order to promote adequate levels of PSC in the country.

Abbreviations

PSC: Patient safety culture

HSOPSC: Hospital Survey on Patient Safety Culture

AHRQ: Agency for Healthcare Research and Quality

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

CI: Confidence interval

Declarations

Authors' contributions

Study design: MB, MeB, Collected data: MB, FJ and MeB, Data analysis: MB, MeB, Final revision and grammar editing: NLB, MB, and Me. All authors read and approved the final manuscript.

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Conflict of interest

The authors declare that they have no competing interests.

Ethics approval

Not applicable.

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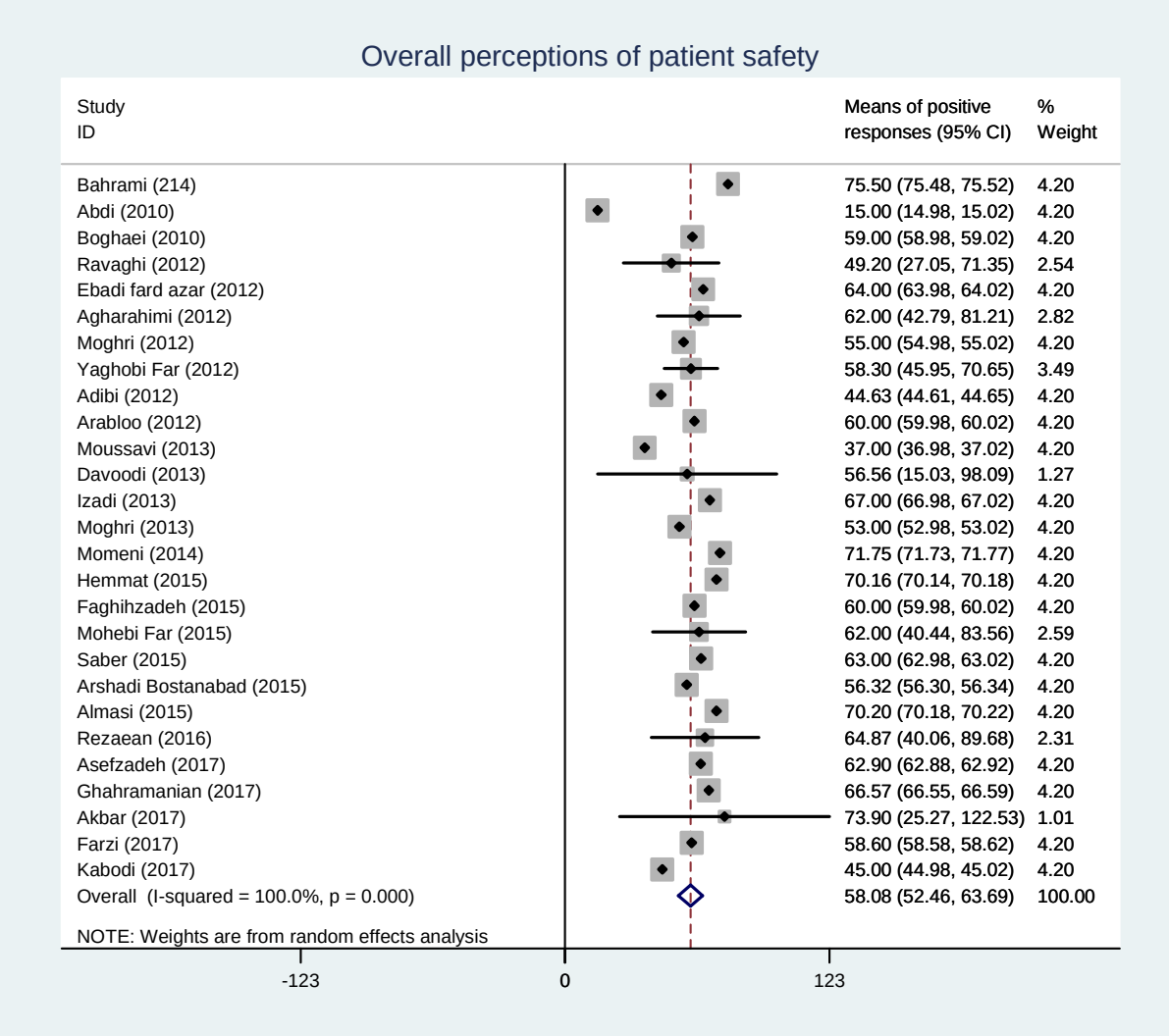
Section/topic	#	Checklist item	Reported on page #
Title: Patient safety culture assessment in Iran using hospital survey on patient safety culture tool: A systematic review and meta-analysis			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	Title
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	Abstract (Background,methods,results,conclusion)
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	Background
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	Not applicable.
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	Not applicable.
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	Methods
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	Methods
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Methods
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	Methods
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	Methods
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	Methods
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	Methods
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	Methods
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	Methods

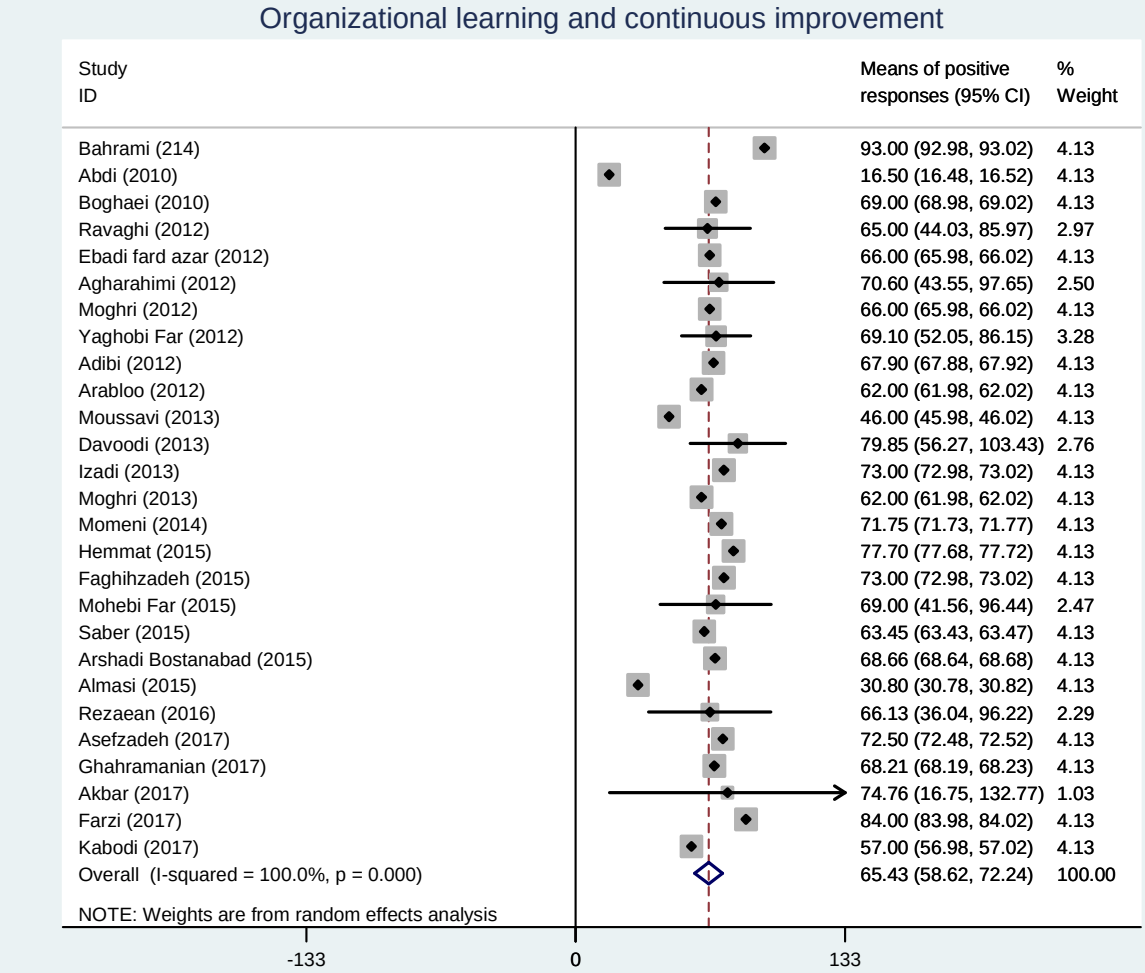
Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	Methods
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	Methods
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	Results
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Results
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Results
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Results
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	Results
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	Results
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	Results
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	Discussion
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	Discussion
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	Conclusion
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	Declarations

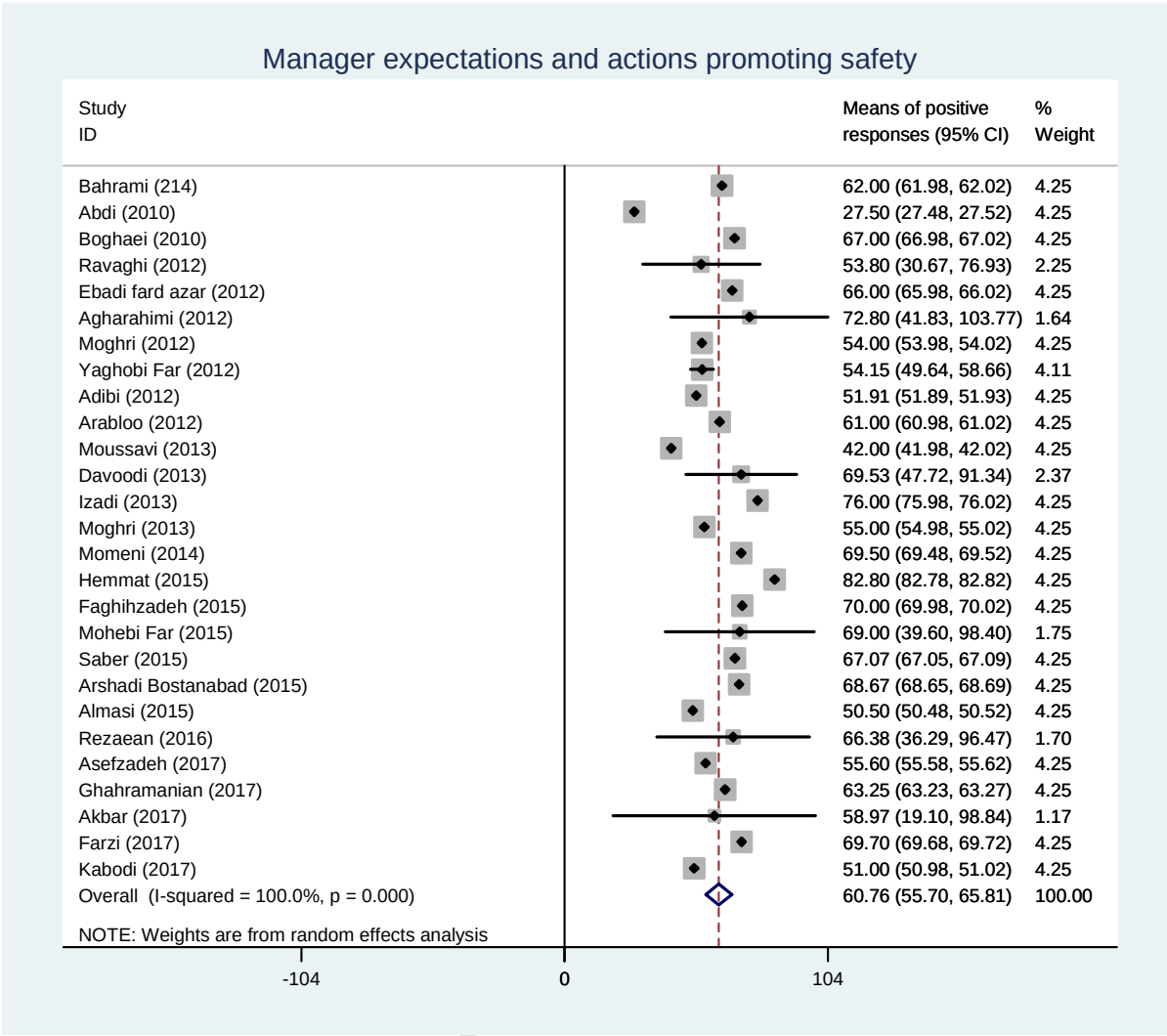
Appendix 2. Quality assessment of studies

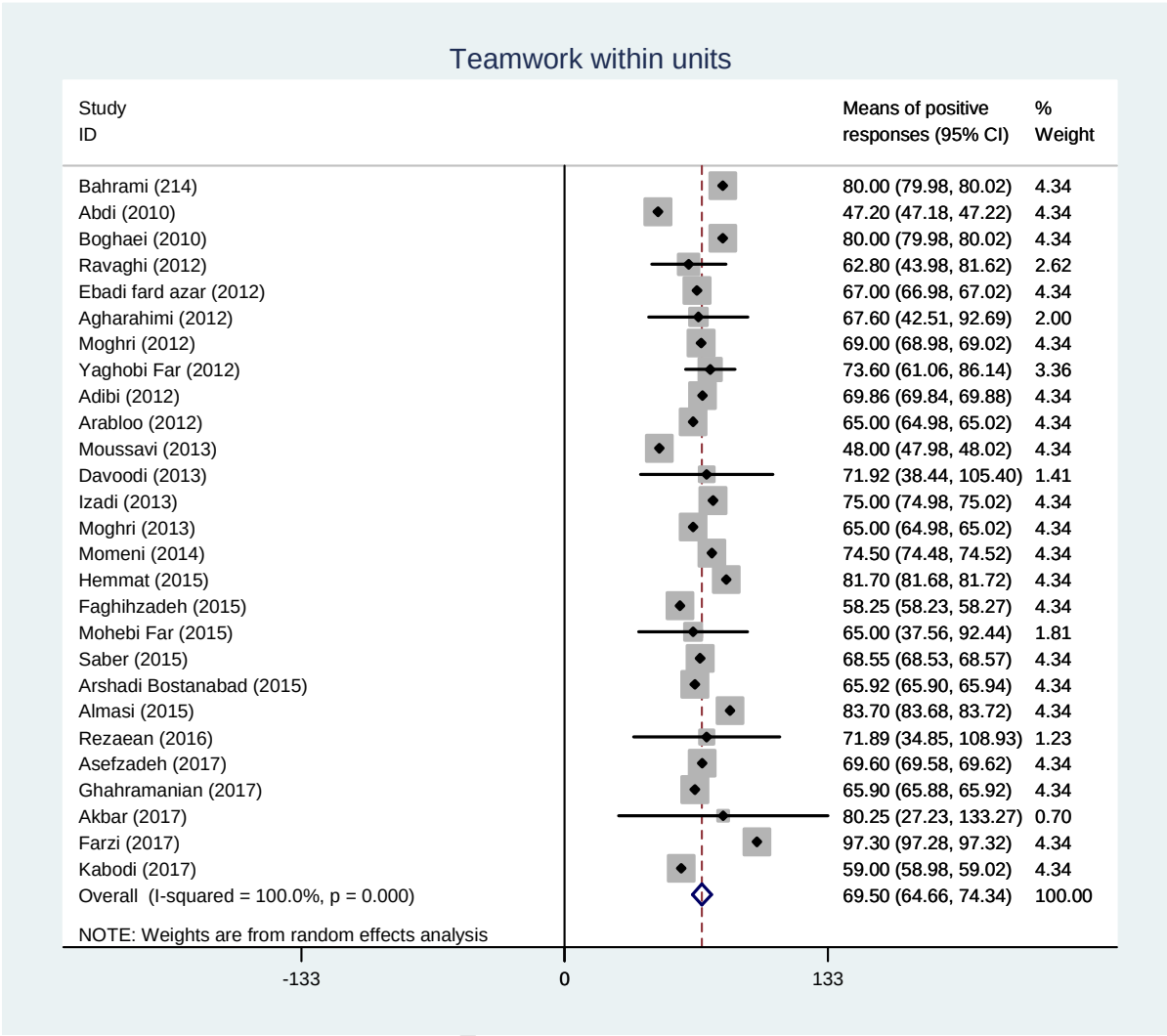
Study	Year	Selection				Comparability	Outcome		Total score from 10
		Representativeness of the sample	Sample size	None respondents	Ascertainment of exposure		Assessment	Statistical test	
Abdi	2012	+	+	+	+	+	+	+	7
Boghaei	2012	+	+	+	++	++	+	++	10
Ravaghi	2012	+	+	+	++	++	+	++	10
Ebadi fard azar	2012	+	+	+	++	++	+	+	9
Agharahimi	2012	+	+	+	+	+	+	+	7
Moghri	2012	+	+	+	+	+	+	+	7
Yaghobi Far	2012	+	+	+	+		+	+	6
Adibi	2012	+	+		+	+	+	+	6
Arabloo	2012	+	+	+	++	++	+	+	9
Moussavi	2013	+	+	+	+		+	+	6
Davoodi	2013	+	+	+	++	++	+	++	10
Izadi	2013	+	+	+	+	+	+	+	7
Moghri	2013	+	+	+	++	+	+	+	8
Bahrami	2014	+	+	+	++	++	+	++	10
Momeni	2014	+	+		+	+	+	+	6
Hemmat	2015	+	+	+	++	++	+	++	10
Faghihzadeh	2015	+	+		+	+	+	+	6
Mohebi Far	2015	+	+	+	+		+	+	6
Saber	2015	+	+		+	+	+	+	6
Arshadi Bostanabad	2015	+	+	+	++	+	+	+	8
Almasi	2015	+	+	+	+	+	+	+	7
Rezaean	2016	+	+	+	+	+	+	+	7
Asefzadeh	2017	+	+	+	++	+	+	+	8
Ghahramanian	2017	+	+	+	+	+	+	+	7
Akbari	2017	+	+	+	++	++	+	++	10
Farzi	2017	+	+	+	++	++	+	+	9
Kabodi	2017	+	+	+	++	+	+	+	8

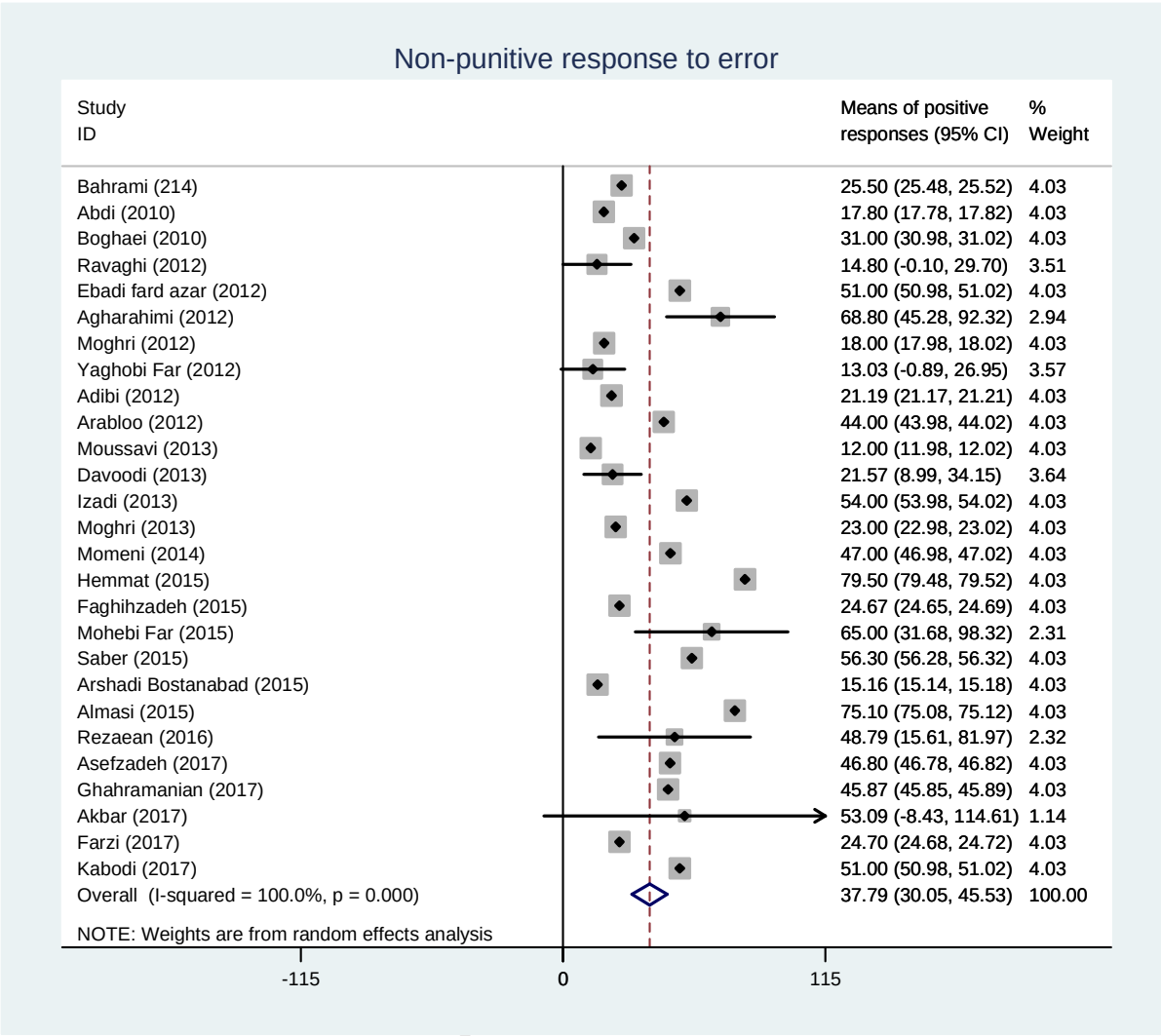
Appendix 3: The mean of the response to the 12 dimensions of the HSPSC

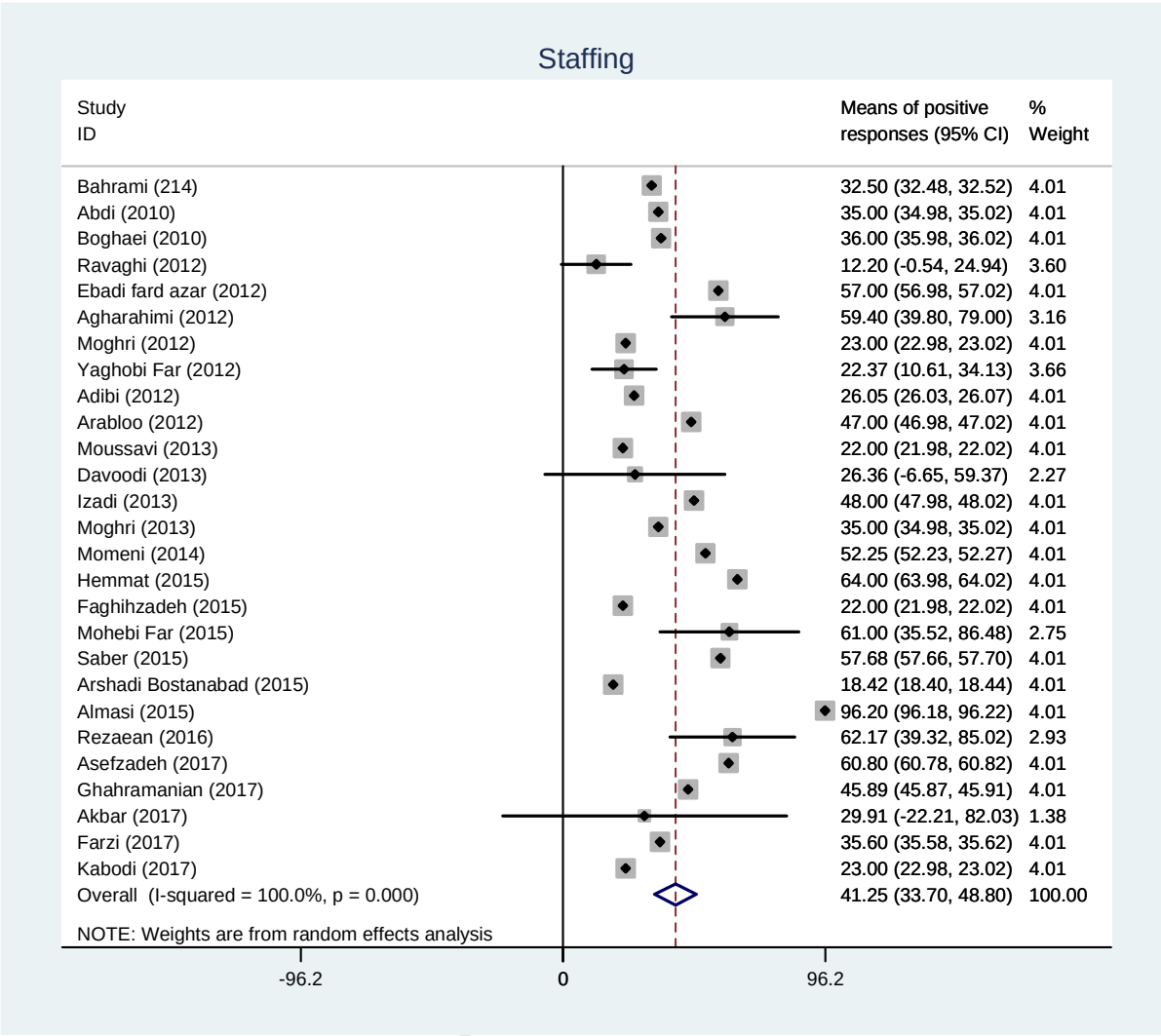


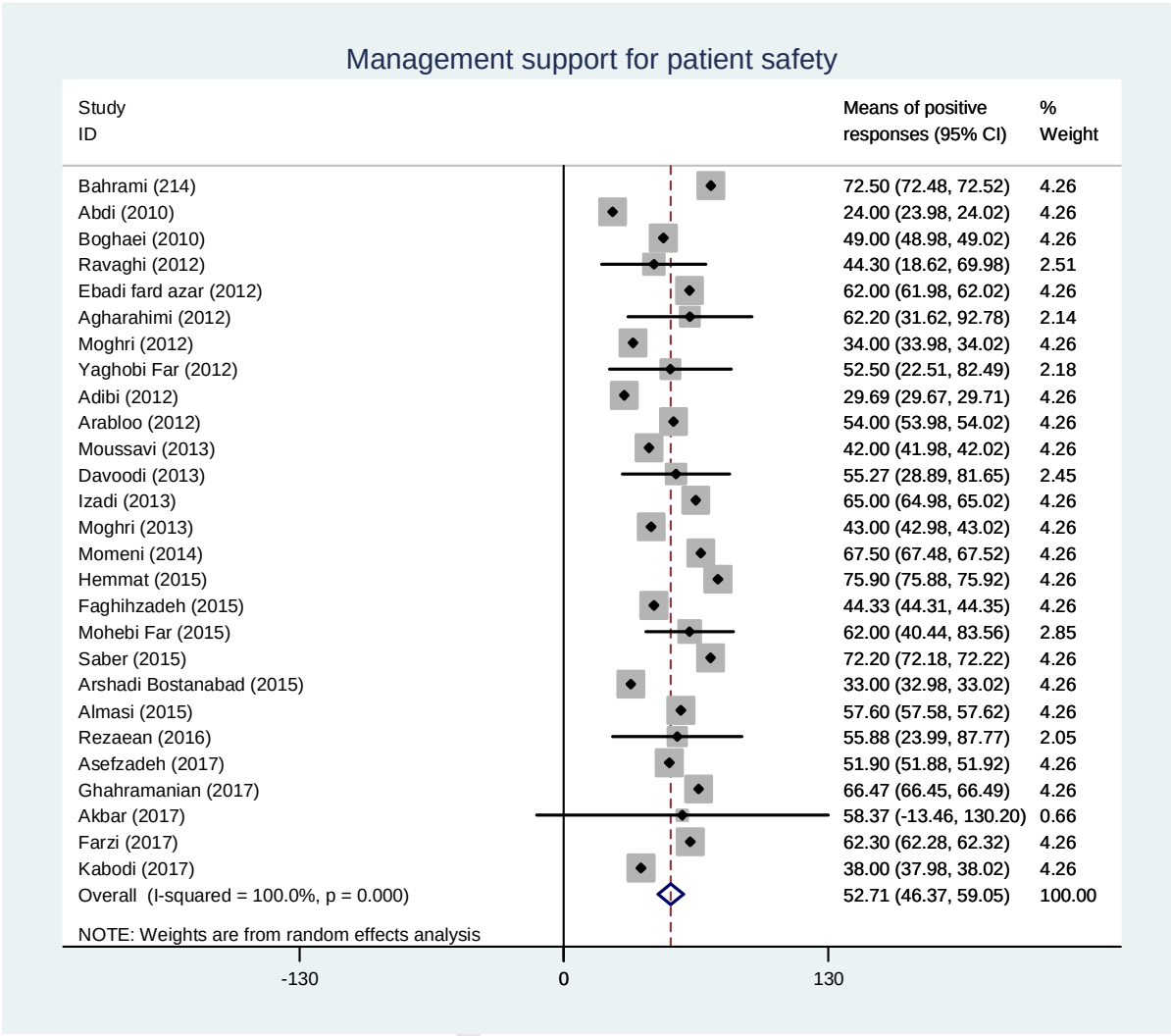

Organizational learning and continuous improvement
Study ID
Means of positive responses (95% CI)
% Weight
Bahrami (214) 93.00 (92.98, 93.02) 4.13
Abdi (2010) 16.50 (16.48, 16.52) 4.13
Boghaei (2010) 69.00 (68.98, 69.02) 4.13
Ravaghi (2012) 65.00 (44.03, 85.97) 2.97
Ebadi fard azar (2012) 66.00 (65.98, 66.02) 4.13
Agharahimi (2012) 70.60 (43.55, 97.65) 2.50
Moghri (2012) 66.00 (65.98, 66.02) 4.13
Yaghobi Far (2012) 69.10 (52.05, 86.15) 3.28
Adibi (2012) 67.90 (67.88, 67.92) 4.13
Arabloo (2012) 62.00 (61.98, 62.02) 4.13
Moussavi (2013) 46.00 (45.98, 46.02) 4.13
Davoodi (2013) 79.85 (56.27, 103.43) 2.76
Izadi (2013) 73.00 (72.98, 73.02) 4.13
Moghri (2013) 62.00 (61.98, 62.02) 4.13
Momeni (2014) 71.75 (71.73, 71.77) 4.13
Hemmat (2015) 77.70 (77.68, 77.72) 4.13
Faghihzadeh (2015) 73.00 (72.98, 73.02) 4.13
Mohebi Far (2015) 69.00 (41.56, 96.44) 2.47
Saber (2015) 63.45 (63.43, 63.47) 4.13
Arshadi Bostanabad (2015) 68.66 (68.64, 68.68) 4.13
Almasi (2015) 30.80 (30.78, 30.82) 4.13
Rezaean (2016) 66.13 (36.04, 96.22) 2.29
Asefzadeh (2017) 72.50 (72.48, 72.52) 4.13
Ghahramanian (2017) 68.21 (68.19, 68.23) 4.13
Akbar (2017) 74.76 (16.75, 132.77) 1.03
Farzi (2017) 84.00 (83.98, 84.02) 4.13
Kabodi (2017) 57.00 (56.98, 57.02) 4.13
Overall (I-squared = 100.0%, p = 0.000) 65.43 (58.62, 72.24) 100.00
NOTE: Weights are from random effects analysis
-133
0
133

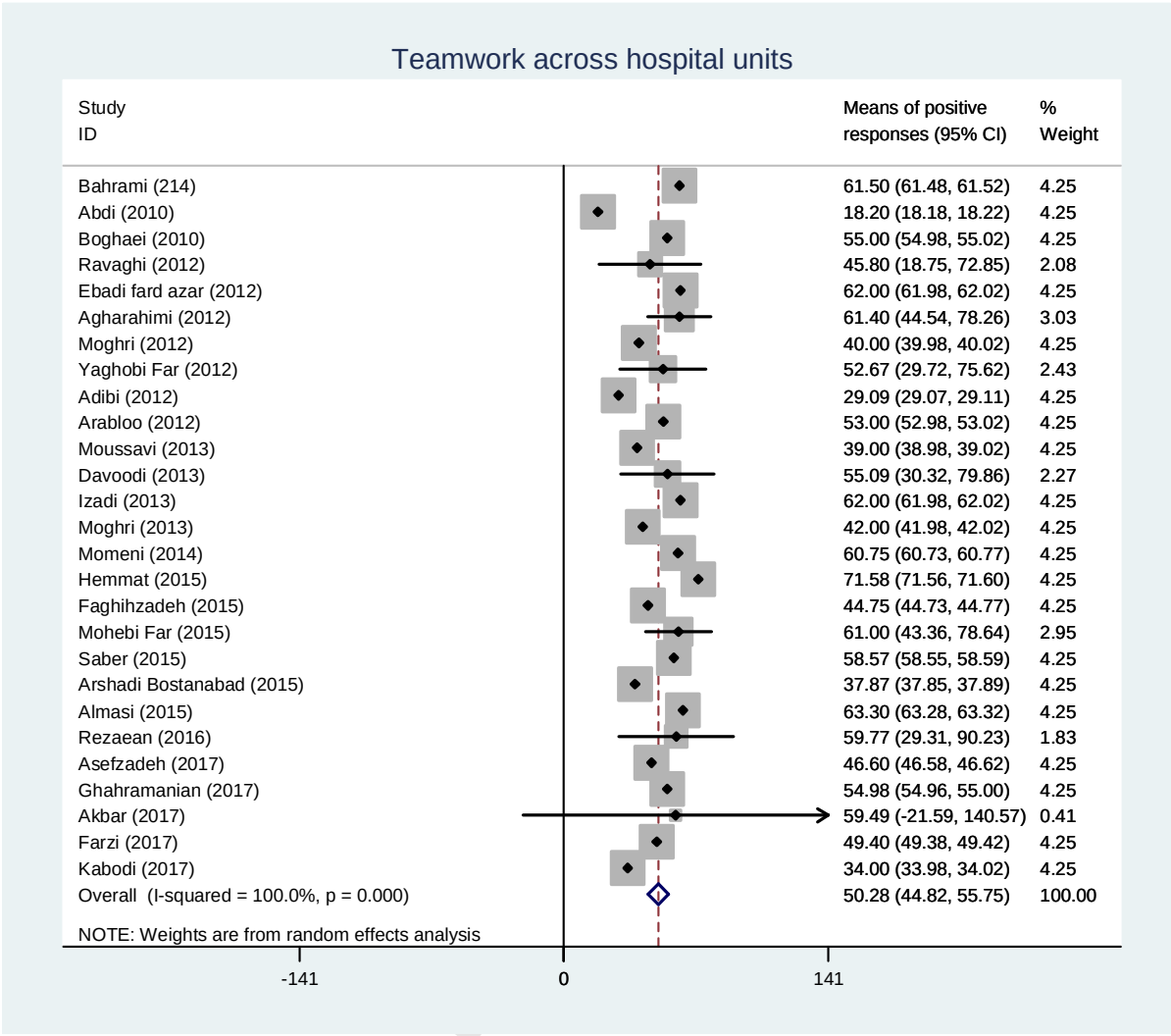

Manager expectations and actions promoting safety
Study ID
Means of positive responses (95% CI)
% Weight
Bahrami (214) 62.00 (61.98, 62.02) 4.25
Abdi (2010) 27.50 (27.48, 27.52) 4.25
Boghaei (2010) 67.00 (66.98, 67.02) 4.25
Ravaghi (2012) 53.80 (30.67, 76.93) 2.25
Ebadi fard azar (2012) 66.00 (65.98, 66.02) 4.25
Agharahimi (2012) 72.80 (41.83, 103.77) 1.64
Moghri (2012) 54.00 (53.98, 54.02) 4.25
Yaghobi Far (2012) 54.15 (49.64, 58.66) 4.11
Adibi (2012) 51.91 (51.89, 51.93) 4.25
Arabloo (2012) 61.00 (60.98, 61.02) 4.25
Moussavi (2013) 42.00 (41.98, 42.02) 4.25
Davoodi (2013) 69.53 (47.72, 91.34) 2.37
Izadi (2013) 76.00 (75.98, 76.02) 4.25
Moghri (2013) 55.00 (54.98, 55.02) 4.25
Momeni (2014) 69.50 (69.48, 69.52) 4.25
Hemmat (2015) 82.80 (82.78, 82.82) 4.25
Faghihzadeh (2015) 70.00 (69.98, 70.02) 4.25
Mohebi Far (2015) 69.00 (39.60, 98.40) 1.75
Saber (2015) 67.07 (67.05, 67.09) 4.25
Arshadi Bostanabad (2015) 68.67 (68.65, 68.69) 4.25
Almasi (2015) 50.50 (50.48, 50.52) 4.25
Rezaean (2016) 66.38 (36.29, 96.47) 1.70
Asefzadeh (2017) 55.60 (55.58, 55.62) 4.25
Ghahramanian (2017) 63.25 (63.23, 63.27) 4.25
Akbar (2017) 58.97 (19.10, 98.84) 1.17
Farzi (2017) 69.70 (69.68, 69.72) 4.25
Kabodi (2017) 51.00 (50.98, 51.02) 4.25
Overall (I-squared = 100.0%, p = 0.000) 60.76 (55.70, 65.81) 100.00
NOTE: Weights are from random effects analysis
-104
0
104

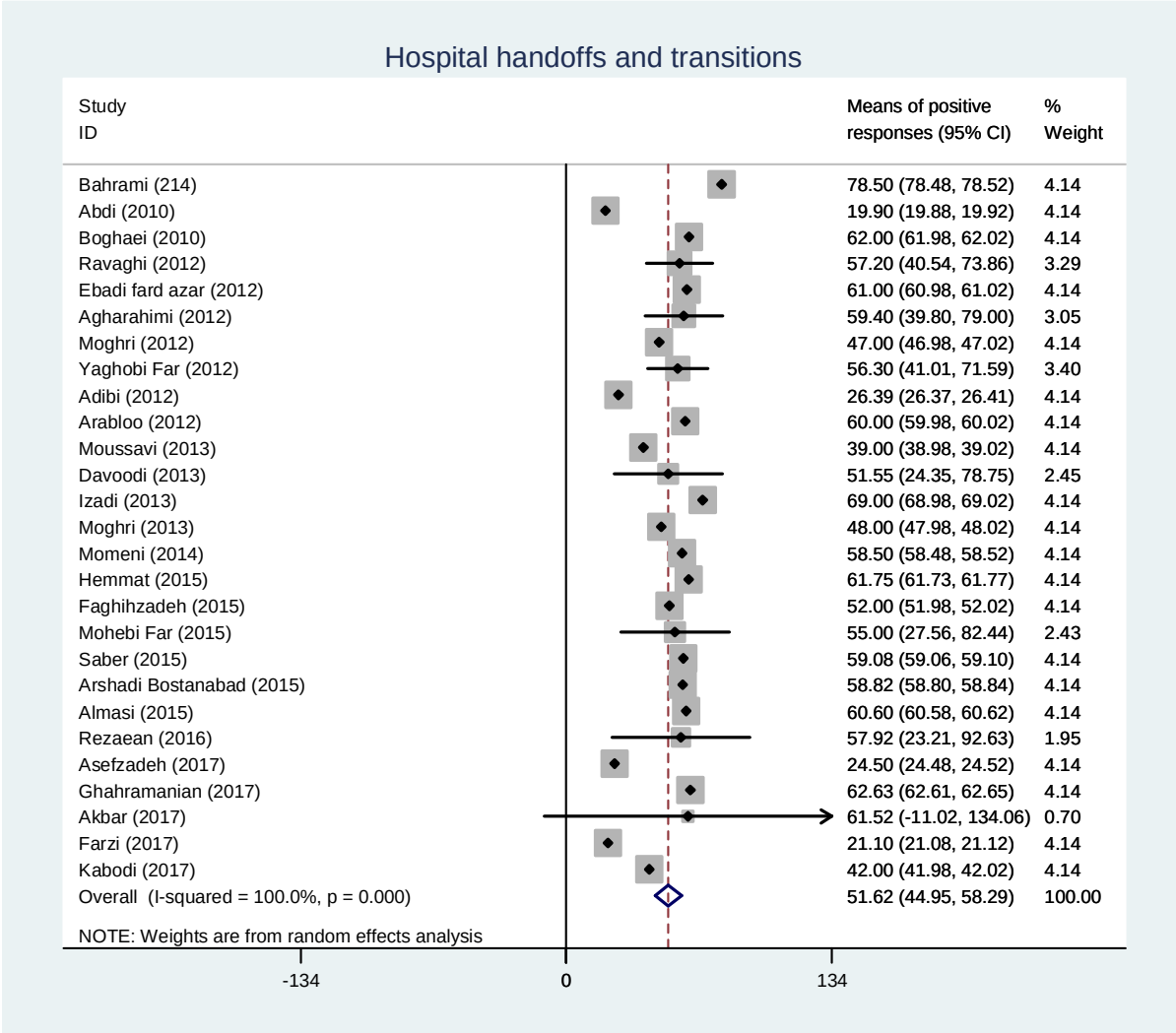

Teamwork within units
Study ID
Means of positive responses (95% CI)
% Weight
Bahrami (214) 80.00 (79.98, 80.02) 4.34
Abdi (2010) 47.20 (47.18, 47.22) 4.34
Boghaei (2010) 80.00 (79.98, 80.02) 4.34
Ravaghi (2012) 62.80 (43.98, 81.62) 2.62
Ebadi fard azar (2012) 67.00 (66.98, 67.02) 4.34
Agharahimi (2012) 67.60 (42.51, 92.69) 2.00
Moghri (2012) 69.00 (68.98, 69.02) 4.34
Yaghobi Far (2012) 73.60 (61.06, 86.14) 3.36
Adibi (2012) 69.86 (69.84, 69.88) 4.34
Arabloo (2012) 65.00 (64.98, 65.02) 4.34
Moussavi (2013) 48.00 (47.98, 48.02) 4.34
Davoodi (2013) 71.92 (38.44, 105.40) 1.41
Izadi (2013) 75.00 (74.98, 75.02) 4.34
Moghri (2013) 65.00 (64.98, 65.02) 4.34
Momeni (2014) 74.50 (74.48, 74.52) 4.34
Hemmat (2015) 81.70 (81.68, 81.72) 4.34
Faghihzadeh (2015) 58.25 (58.23, 58.27) 4.34
Mohebi Far (2015) 65.00 (37.56, 92.44) 1.81
Saber (2015) 68.55 (68.53, 68.57) 4.34
Arshadi Bostanabad (2015) 65.92 (65.90, 65.94) 4.34
Almasi (2015) 83.70 (83.68, 83.72) 4.34
Rezaean (2016) 71.89 (34.85, 108.93) 1.23
Asefzadeh (2017) 69.60 (69.58, 69.62) 4.34
Ghahramanian (2017) 65.90 (65.88, 65.92) 4.34
Akbar (2017) 80.25 (27.23, 133.27) 0.70
Farzi (2017) 97.30 (97.28, 97.32) 4.34
Kabodi (2017) 59.00 (58.98, 59.02) 4.34
Overall (I-squared = 100.0%, p = 0.000) 69.50 (64.66, 74.34) 100.00
NOTE: Weights are from random effects analysis
-133
0
133

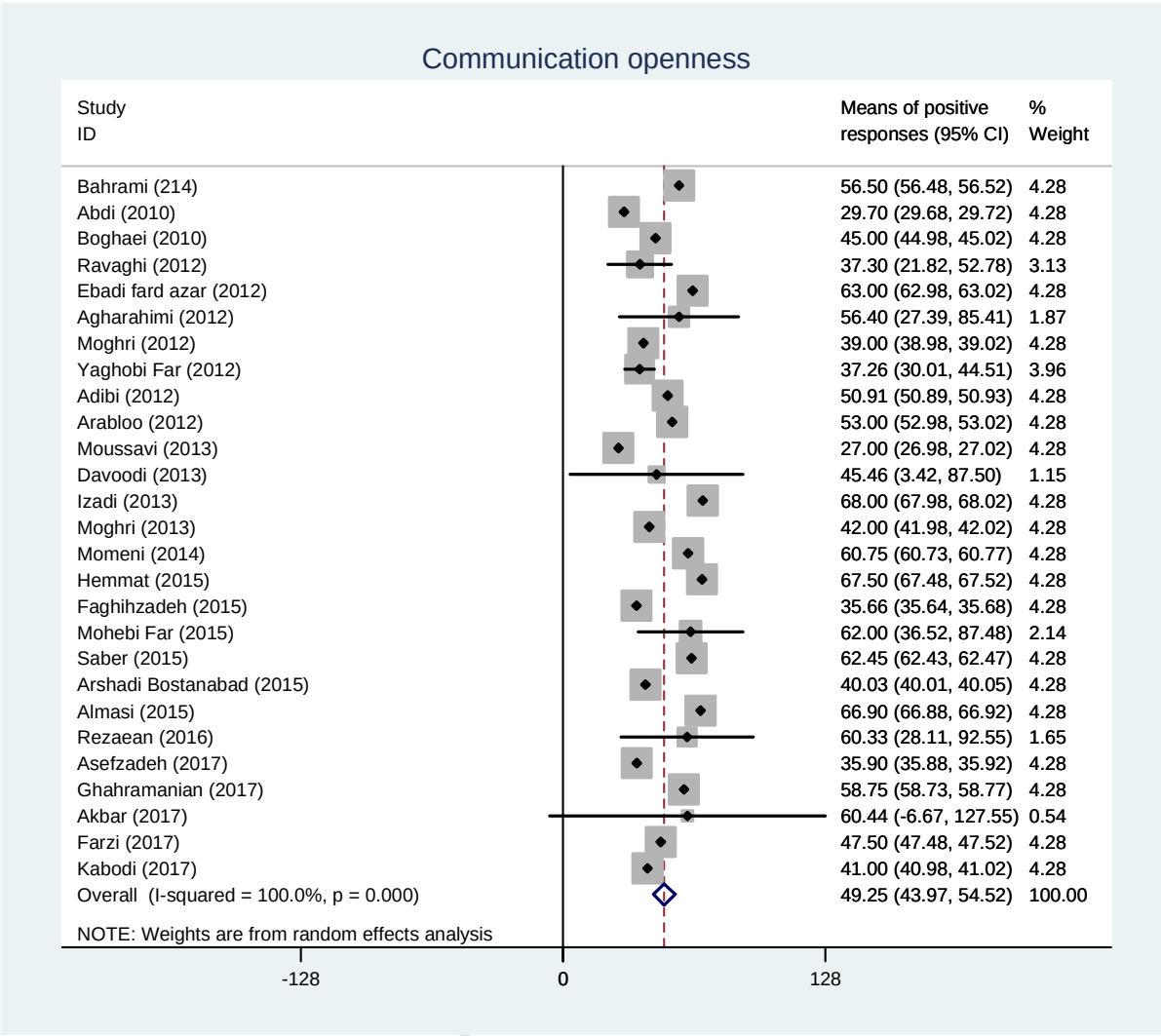

Non-punitive response to error
Study ID
Means of positive responses (95% CI)
% Weight
Bahrami (214) 25.50 (25.48, 25.52) 4.03
Abdi (2010) 17.80 (17.78, 17.82) 4.03
Boghaei (2010) 31.00 (30.98, 31.02) 4.03
Ravaghi (2012) 14.80 (-0.10, 29.70) 3.51
Ebadi fard azar (2012) 51.00 (50.98, 51.02) 4.03
Agharahimi (2012) 68.80 (45.28, 92.32) 2.94
Moghri (2012) 18.00 (17.98, 18.02) 4.03
Yaghobi Far (2012) 13.03 (-0.89, 26.95) 3.57
Adibi (2012) 21.19 (21.17, 21.21) 4.03
Arabloo (2012) 44.00 (43.98, 44.02) 4.03
Moussavi (2013) 12.00 (11.98, 12.02) 4.03
Davoodi (2013) 21.57 (8.99, 34.15) 3.64
Izadi (2013) 54.00 (53.98, 54.02) 4.03
Moghri (2013) 23.00 (22.98, 23.02) 4.03
Momeni (2014) 47.00 (46.98, 47.02) 4.03
Hemmat (2015) 79.50 (79.48, 79.52) 4.03
Faghihzadeh (2015) 24.67 (24.65, 24.69) 4.03
Mohebi Far (2015) 65.00 (31.68, 98.32) 2.31
Saber (2015) 56.30 (56.28, 56.32) 4.03
Arshadi Bostanabad (2015) 15.16 (15.14, 15.18) 4.03
Almasi (2015) 75.10 (75.08, 75.12) 4.03
Rezaean (2016) 48.79 (15.61, 81.97) 2.32
Asefzadeh (2017) 46.80 (46.78, 46.82) 4.03
Ghahramanian (2017) 45.87 (45.85, 45.89) 4.03
Akbar (2017) 53.09 (-8.43, 114.61) 1.14
Farzi (2017) 24.70 (24.68, 24.72) 4.03
Kabodi (2017) 51.00 (50.98, 51.02) 4.03
Overall (I-squared = 100.0%, p = 0.000) 37.79 (30.05, 45.53) 100.00
NOTE: Weights are from random effects analysis
-115
0
115



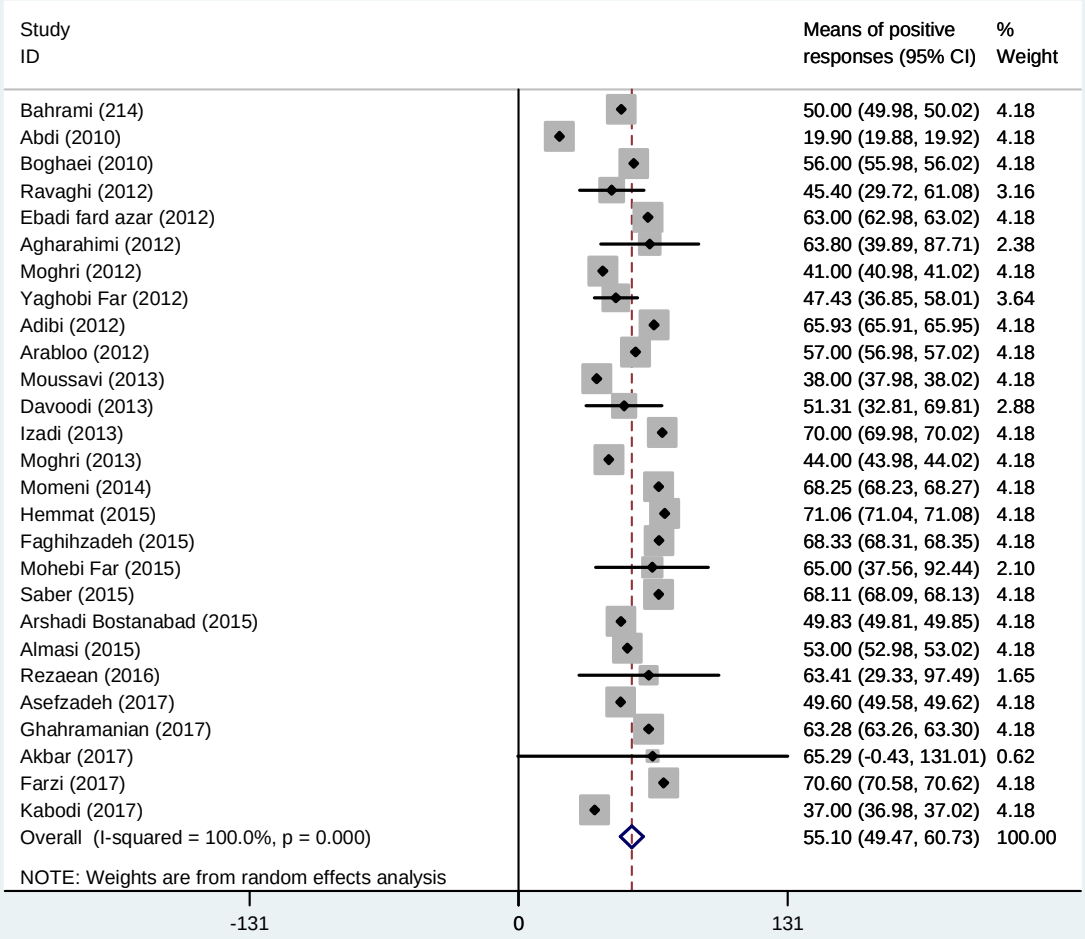

Management support for patient safety
Study
ID
Means of positive responses (95% CI)
% Weight
Bahrami (214) 72.50 (72.48, 72.52) 4.26
Abdi (2010) 24.00 (23.98, 24.02) 4.26
Boghaei (2010) 49.00 (48.98, 49.02) 4.26
Ravaghi (2012) 44.30 (18.62, 69.98) 2.51
Ebadi fard azar (2012) 62.00 (61.98, 62.02) 4.26
Agharahimi (2012) 62.20 (31.62, 92.78) 2.14
Moghri (2012) 34.00 (33.98, 34.02) 4.26
Yaghobi Far (2012) 52.50 (22.51, 82.49) 2.18
Adibi (2012) 29.69 (29.67, 29.71) 4.26
Arabloo (2012) 54.00 (53.98, 54.02) 4.26
Moussavi (2013) 42.00 (41.98, 42.02) 4.26
Davoodi (2013) 55.27 (28.89, 81.65) 2.45
Izadi (2013) 65.00 (64.98, 65.02) 4.26
Moghri (2013) 43.00 (42.98, 43.02) 4.26
Momeni (2014) 67.50 (67.48, 67.52) 4.26
Hemmat (2015) 75.90 (75.88, 75.92) 4.26
Faghihzadeh (2015) 44.33 (44.31, 44.35) 4.26
Mohebi Far (2015) 62.00 (40.44, 83.56) 2.85
Saber (2015) 72.20 (72.18, 72.22) 4.26
Arshadi Bostanabad (2015) 33.00 (32.98, 33.02) 4.26
Almasi (2015) 57.60 (57.58, 57.62) 4.26
Rezaean (2016) 55.88 (23.99, 87.77) 2.05
Asefzadeh (2017) 51.90 (51.88, 51.92) 4.26
Ghahramanian (2017) 66.47 (66.45, 66.49) 4.26
Akbar (2017) 58.37 (-13.46, 130.20) 0.66
Farzi (2017) 62.30 (62.28, 62.32) 4.26
Kabodi (2017) 38.00 (37.98, 38.02) 4.26
Overall (I-squared = 100.0%, p = 0.000) 52.71 (46.37, 59.05) 100.00
NOTE: Weights are from random effects analysis
-130
0
130

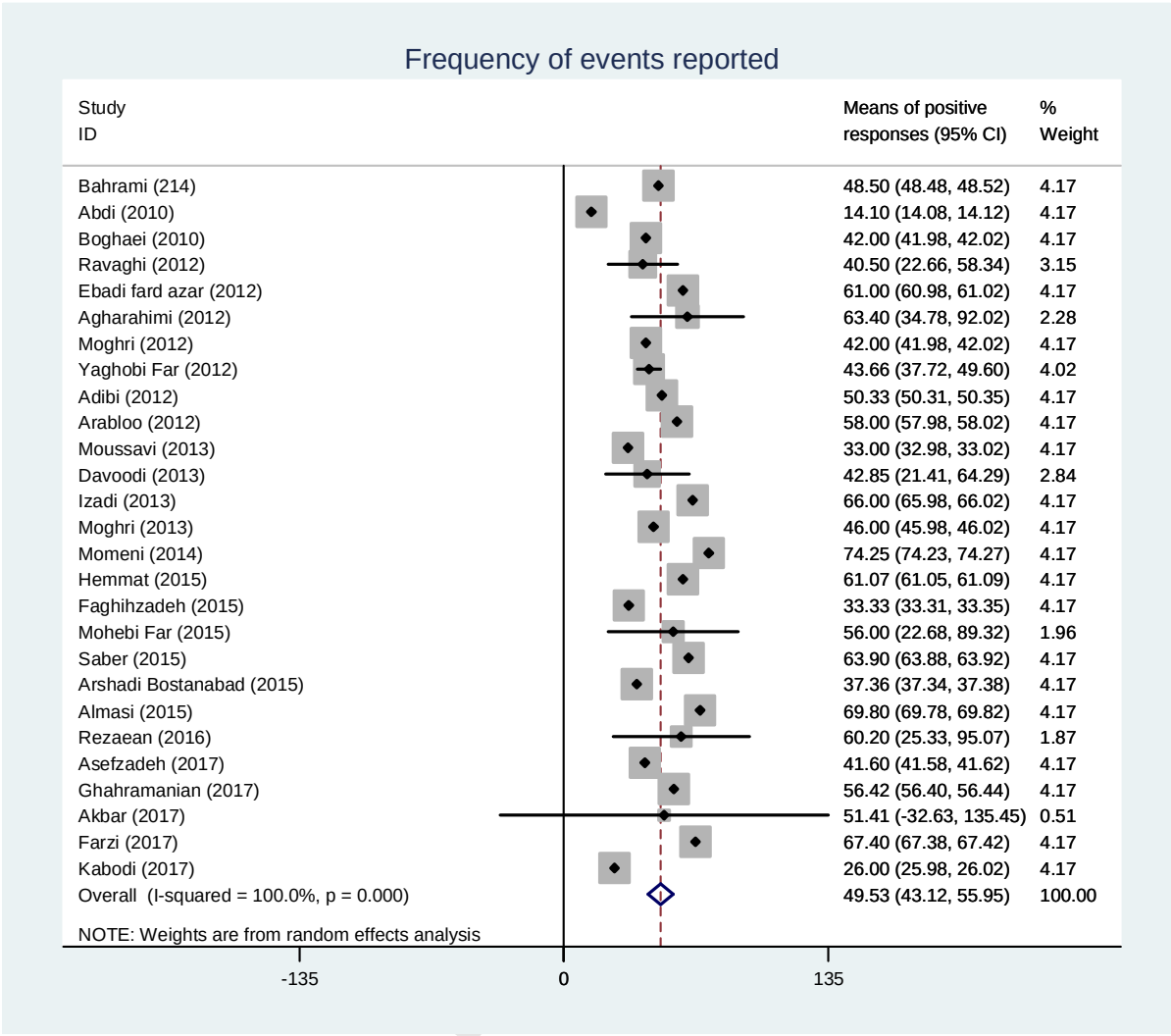

Teamwork across hospital units
Study ID
Means of positive responses (95% CI)
% Weight
Bahrami (214) 61.50 (61.48, 61.52) 4.25
Abdi (2010) 18.20 (18.18, 18.22) 4.25
Boghaei (2010) 55.00 (54.98, 55.02) 4.25
Ravaghi (2012) 45.80 (18.75, 72.85) 2.08
Ebadi fard azar (2012) 62.00 (61.98, 62.02) 4.25
Agharahimi (2012) 61.40 (44.54, 78.26) 3.03
Moghri (2012) 40.00 (39.98, 40.02) 4.25
Yaghobi Far (2012) 52.67 (29.72, 75.62) 2.43
Adibi (2012) 29.09 (29.07, 29.11) 4.25
Arabloo (2012) 53.00 (52.98, 53.02) 4.25
Moussavi (2013) 39.00 (38.98, 39.02) 4.25
Davoodi (2013) 55.09 (30.32, 79.86) 2.27
Izadi (2013) 62.00 (61.98, 62.02) 4.25
Moghri (2013) 42.00 (41.98, 42.02) 4.25
Momeni (2014) 60.75 (60.73, 60.77) 4.25
Hemmat (2015) 71.58 (71.56, 71.60) 4.25
Faghihzadeh (2015) 44.75 (44.73, 44.77) 4.25
Mohebi Far (2015) 61.00 (43.36, 78.64) 2.95
Saber (2015) 58.57 (58.55, 58.59) 4.25
Arshadi Bostanabad (2015) 37.87 (37.85, 37.89) 4.25
Almasi (2015) 63.30 (63.28, 63.32) 4.25
Rezaean (2016) 59.77 (29.31, 90.23) 1.83
Asefzadeh (2017) 46.60 (46.58, 46.62) 4.25
Ghahramanian (2017) 54.98 (54.96, 55.00) 4.25
Akbar (2017) 59.49 (-21.59, 140.57) 0.41
Farzi (2017) 49.40 (49.38, 49.42) 4.25
Kabodi (2017) 34.00 (33.98, 34.02) 4.25
Overall (I-squared = 100.0%, p = 0.000) 50.28 (44.82, 55.75) 100.00
NOTE: Weights are from random effects analysis
-141
0
141


Hospital handoffs and transitions
Study ID
Means of positive responses (95% CI)
% Weight
Bahrami (214) 78.50 (78.48, 78.52) 4.14
Abdi (2010) 19.90 (19.88, 19.92) 4.14
Boghaei (2010) 62.00 (61.98, 62.02) 4.14
Ravaghi (2012) 57.20 (40.54, 73.86) 3.29
Ebadi fard azar (2012) 61.00 (60.98, 61.02) 4.14
Agharahimi (2012) 59.40 (39.80, 79.00) 3.05
Moghri (2012) 47.00 (46.98, 47.02) 4.14
Yaghobi Far (2012) 56.30 (41.01, 71.59) 3.40
Adibi (2012) 26.39 (26.37, 26.41) 4.14
Arabloo (2012) 60.00 (59.98, 60.02) 4.14
Moussavi (2013) 39.00 (38.98, 39.02) 4.14
Davoodi (2013) 51.55 (24.35, 78.75) 2.45
Izadi (2013) 69.00 (68.98, 69.02) 4.14
Moghri (2013) 48.00 (47.98, 48.02) 4.14
Momeni (2014) 58.50 (58.48, 58.52) 4.14
Hemmat (2015) 61.75 (61.73, 61.77) 4.14
Faghihzadeh (2015) 52.00 (51.98, 52.02) 4.14
Mohebi Far (2015) 55.00 (27.56, 82.44) 2.43
Saber (2015) 59.08 (59.06, 59.10) 4.14
Arshadi Bostanabad (2015) 58.82 (58.80, 58.84) 4.14
Almasi (2015) 60.60 (60.58, 60.62) 4.14
Rezaean (2016) 57.92 (23.21, 92.63) 1.95
Asefzadeh (2017) 24.50 (24.48, 24.52) 4.14
Ghahramanian (2017) 62.63 (62.61, 62.65) 4.14
Akbar (2017) 61.52 (-11.02, 134.06) 0.70
Farzi (2017) 21.10 (21.08, 21.12) 4.14
Kabodi (2017) 42.00 (41.98, 42.02) 4.14
Overall (I-squared = 100.0%, p = 0.000) 51.62 (44.95, 58.29) 100.00
NOTE: Weights are from random effects analysis
-134
0
134


Communication openness
Study ID
Means of positive responses (95% CI)
% Weight
Bahrami (214) 56.50 (56.48, 56.52) 4.28
Abdi (2010) 29.70 (29.68, 29.72) 4.28
Boghaei (2010) 45.00 (44.98, 45.02) 4.28
Ravaghi (2012) 37.30 (21.82, 52.78) 3.13
Ebadi fard azar (2012) 63.00 (62.98, 63.02) 4.28
Agharahimi (2012) 56.40 (27.39, 85.41) 1.87
Moghri (2012) 39.00 (38.98, 39.02) 4.28
Yaghobi Far (2012) 37.26 (30.01, 44.51) 3.96
Adibi (2012) 50.91 (50.89, 50.93) 4.28
Arabloo (2012) 53.00 (52.98, 53.02) 4.28
Moussavi (2013) 27.00 (26.98, 27.02) 4.28
Davoodi (2013) 45.46 (3.42, 87.50) 1.15
Izadi (2013) 68.00 (67.98, 68.02) 4.28
Moghri (2013) 42.00 (41.98, 42.02) 4.28
Momeni (2014) 60.75 (60.73, 60.77) 4.28
Hemmat (2015) 67.50 (67.48, 67.52) 4.28
Faghihzadeh (2015) 35.66 (35.64, 35.68) 4.28
Mohebi Far (2015) 62.00 (36.52, 87.48) 2.14
Saber (2015) 62.45 (62.43, 62.47) 4.28
Arshadi Bostanabad (2015) 40.03 (40.01, 40.05) 4.28
Almasi (2015) 66.90 (66.88, 66.92) 4.28
Rezaean (2016) 60.33 (28.11, 92.55) 1.65
Asefzadeh (2017) 35.90 (35.88, 35.92) 4.28
Ghahramanian (2017) 58.75 (58.73, 58.77) 4.28
Akbar (2017) 60.44 (-6.67, 127.55) 0.54
Farzi (2017) 47.50 (47.48, 47.52) 4.28
Kabodi (2017) 41.00 (40.98, 41.02) 4.28
Overall (I-squared = 100.0%, p = 0.000) 49.25 (43.97, 54.52) 100.00
NOTE: Weights are from random effects analysis
-128
0
128

Feedback and communication about error




Frequency of events reported
Study ID
Means of positive responses (95% CI)
% Weight
Bahrami (214) 48.50 (48.48, 48.52) 4.17
Abdi (2010) 14.10 (14.08, 14.12) 4.17
Boghaei (2010) 42.00 (41.98, 42.02) 4.17
Ravaghi (2012) 40.50 (22.66, 58.34) 3.15
Ebadi fard azar (2012) 61.00 (60.98, 61.02) 4.17
Agharahimi (2012) 63.40 (34.78, 92.02) 2.28
Moghri (2012) 42.00 (41.98, 42.02) 4.17
Yaghobi Far (2012) 43.66 (37.72, 49.60) 4.02
Adibi (2012) 50.33 (50.31, 50.35) 4.17
Arabloo (2012) 58.00 (57.98, 58.02) 4.17
Moussavi (2013) 33.00 (32.98, 33.02) 4.17
Davoodi (2013) 42.85 (21.41, 64.29) 2.84
Izadi (2013) 66.00 (65.98, 66.02) 4.17
Moghri (2013) 46.00 (45.98, 46.02) 4.17
Momeni (2014) 74.25 (74.23, 74.27) 4.17
Hemmat (2015) 61.07 (61.05, 61.09) 4.17
Faghihzadeh (2015) 33.33 (33.31, 33.35) 4.17
Mohebi Far (2015) 56.00 (22.68, 89.32) 1.96
Saber (2015) 63.90 (63.88, 63.92) 4.17
Arshadi Bostanabad (2015) 37.36 (37.34, 37.38) 4.17
Almasi (2015) 69.80 (69.78, 69.82) 4.17
Rezaean (2016) 60.20 (25.33, 95.07) 1.87
Asefzadeh (2017) 41.60 (41.58, 41.62) 4.17
Ghahramanian (2017) 56.42 (56.40, 56.44) 4.17
Akbar (2017) 51.41 (-32.63, 135.45) 0.51
Farzi (2017) 67.40 (67.38, 67.42) 4.17
Kabodi (2017) 26.00 (25.98, 26.02) 4.17
Overall (I-squared = 100.0%, p = 0.000) 49.53 (43.12, 55.95) 100.00
NOTE: Weights are from random effects analysis
-135
0
135

Name	Year	Participants	City	Sample size
Abdi	2012	Mixed	Tehran	311
Boghaei	2012	Mixed	Uromia	500
Ravaghi	2012	Mixed	Tehran	216
Ebadi fard azar	2012	Mixed	Tehran	145
Agharahimi	2012	Mixed	Isfahan	94
Moghri	2012	Mixed	Tehran	343
Yaghobi Far	2012	Mixed	Sabzevar	207
Adibi	2012	Mixed	Tehran	90
Arabloo	2012	Mixed	Qazvin	145
Moussavi	2013	Mixed	Tehran	175
Davoodi	2013	Mixed	Mashhad	922
Izadi	2013	Mixed	Isfahan	196
Moghri	2013	Mixed	Several city	725
Bahrami	2014	Nurses	Yazd	340
Momeni	2014	Mixed	Tehran	332
Hemmat	2015	Nurses	Isfahan	83
Faghihzadeh	2015	Nurses	Amol	530
Mohebi Far	2015	Mixed	Tehran	312
Saber	2015	Mixed	Kerman	439
Arshadi Bostanabad	2015	Nurses	Tabriz	99
Almasi	2015	Mixed	Kermanshah	872
Rezaean	2016	Mixed	Yasuj	361
Asefzadeh	2017	Nurses	Sari	380
Ghahramanian	2017	Nurses-Physician	Tabriz	401
Akbari	2017	Mixed	Ilam	299
Farzi	2017	Nurses	Isfahan	367
Kabodi	2017	Mixed	Kermanshah	380

Table 1: characteristics of studies

Mixed: Physicians-nurses-other staff

Items	Mean of positive responses on patient safety culture dimensions (%) 95% CI	I^2	P value
Organizational learning and continuous improvement	65.43 (58.62 – 72.24)	100%	0.000
Manager expectations and actions promoting safety	60.76 (55.70 – 65.81)	100%	0.000
Teamwork within units	60.50 (64.66 – 74.34)	100%	0.000
Overall perceptions of patient safety	58.8 (52.46 – 63.69)	100%	0.000
Feedback and communication about error	55.10 (49.47 – 60.73)	100%	0.000
Management support for patient safety	52.71 (46.37 – 59.05)	100%	0.000
Hospital handoffs and transitions	51.62 (44.95 – 58.29)	100%	0.000
Teamwork across hospital units	50.28 (44.82 – 55.75)	100%	0.000
Frequency of events reported	49.53 (43.12 – 55.95)	100%	0.000
Communication openness	49.25 (43.97 – 54.52)	100%	0.000
Staffing	41.25 (33.70 – 48.80)	100%	0.000
Non-punitive response to error	37.79 (30.05 – 45.53)	100%	0.000

Table 2. Mean of 12 dimensions of HSOPSC tool in Iran

Number of reporting events	Mean (%) 95% CI	I^2	P value
1 – 2	28.59 (22.67 – 34.50)	100%	0.000
3 – 5	9.73 (7.63 – 11.82)	100%	0.000
6 – 10	3.76 (3.07 – 4.45)	100%	0.000
11 – 20	1 (0.48 – 1.52)	100%	0.000
>20	1.20 (0.22 – 2.18)	100%	0.000
No event	54.19 (45.56 – 62.81)	100%	0.000

Table 3. Mean of reporting events of HSOPSC tool in Iran

Items	Mean (%) 95% CI	I^2	P value
Excellent	4.74 (2.88 – 6.61)	100%	0.000
Very good	19.70 (14.40 – 25)	100%	0.000
Acceptable	55.93 (51.20 – 60.66)	100%	0.000
Poor	12.48 (8.05 – 16.9)	100%	0.000
Failing	6.51 (2.44 – 10.57)	100%	0.000

Table 4. Mean of graded responses as assessed by means of HSOPSC tool in Iran

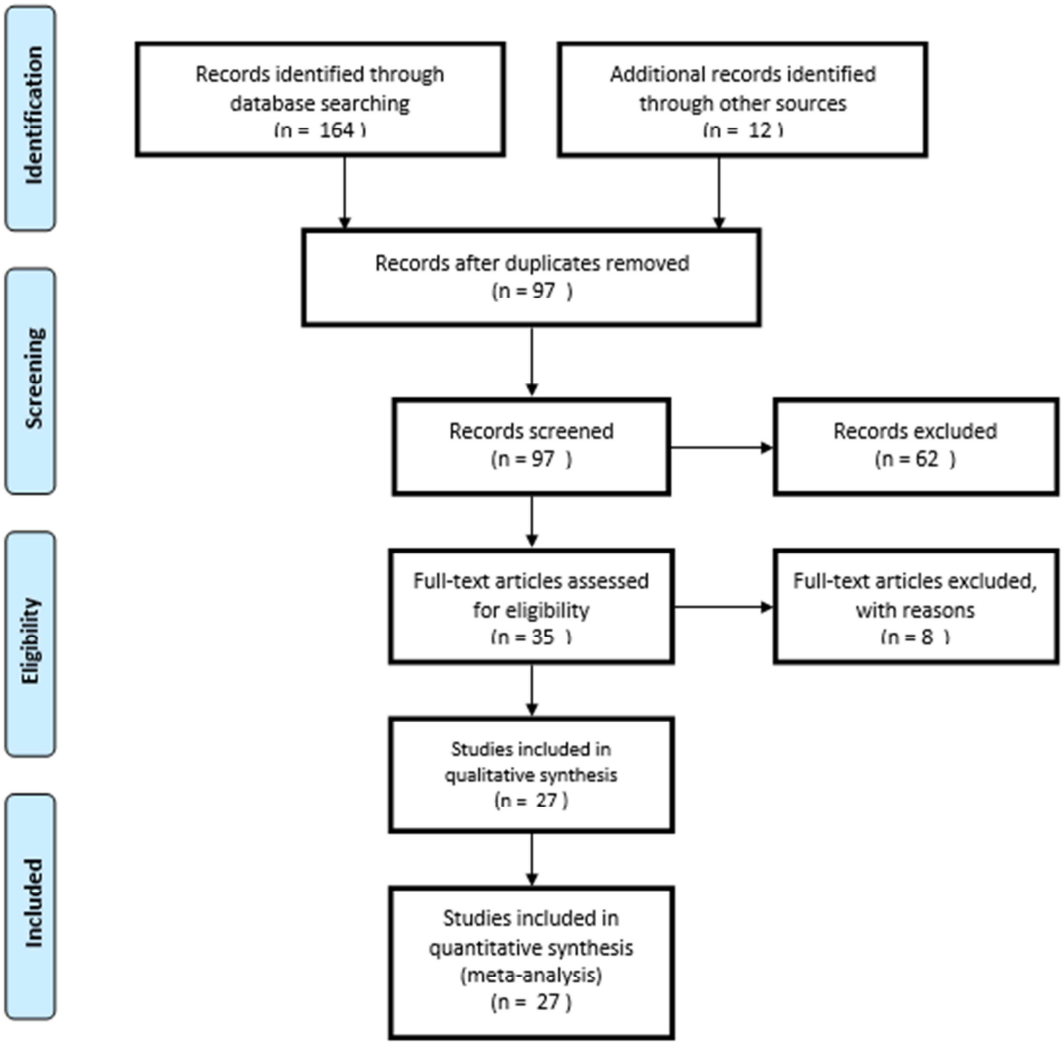


Figure 1. Selection process workflow

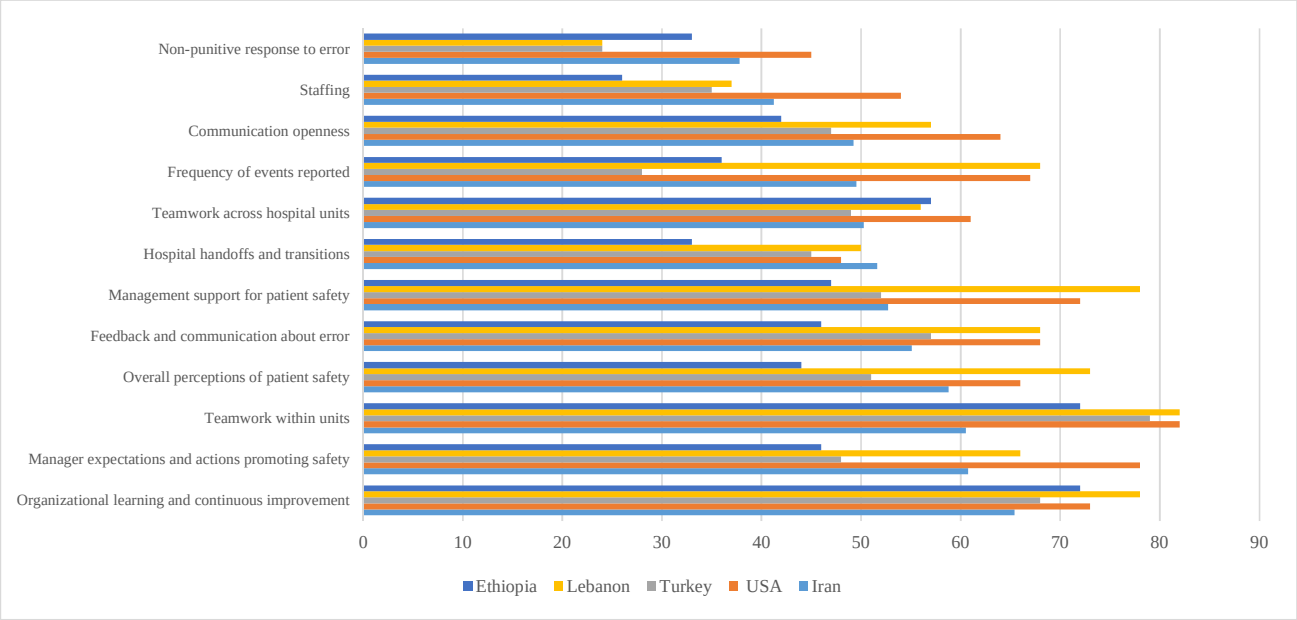


Figure 2. Comparison of mean response in Iran versus other countries

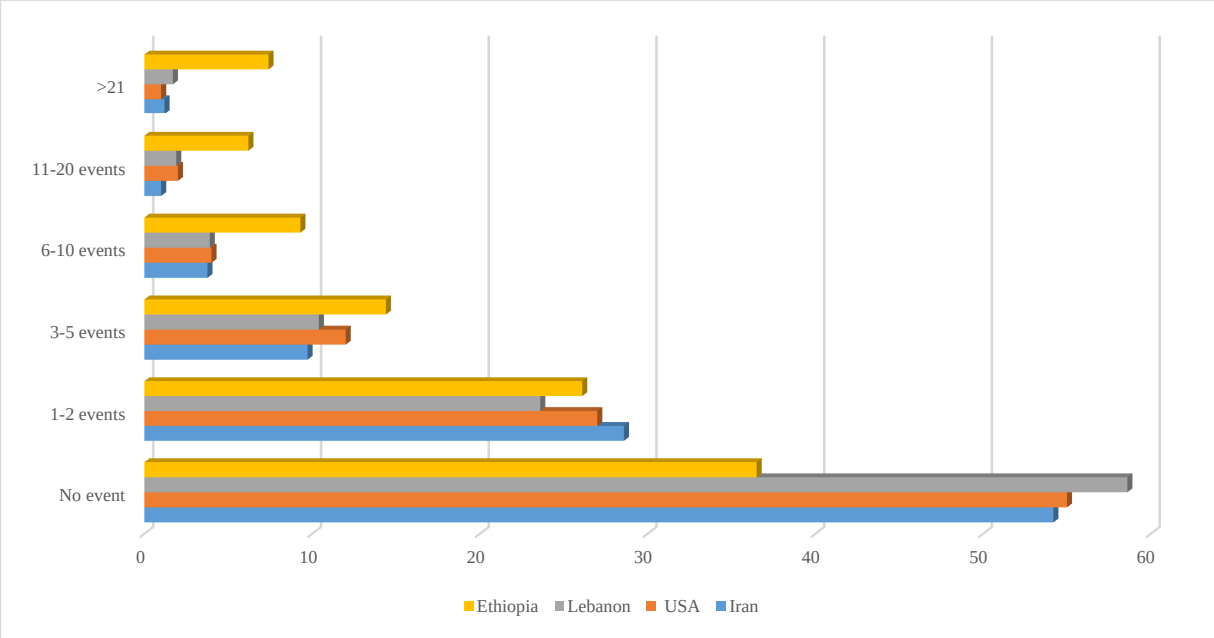


Figure 3. Comparison of mean of reporting events in Iran versus other countries

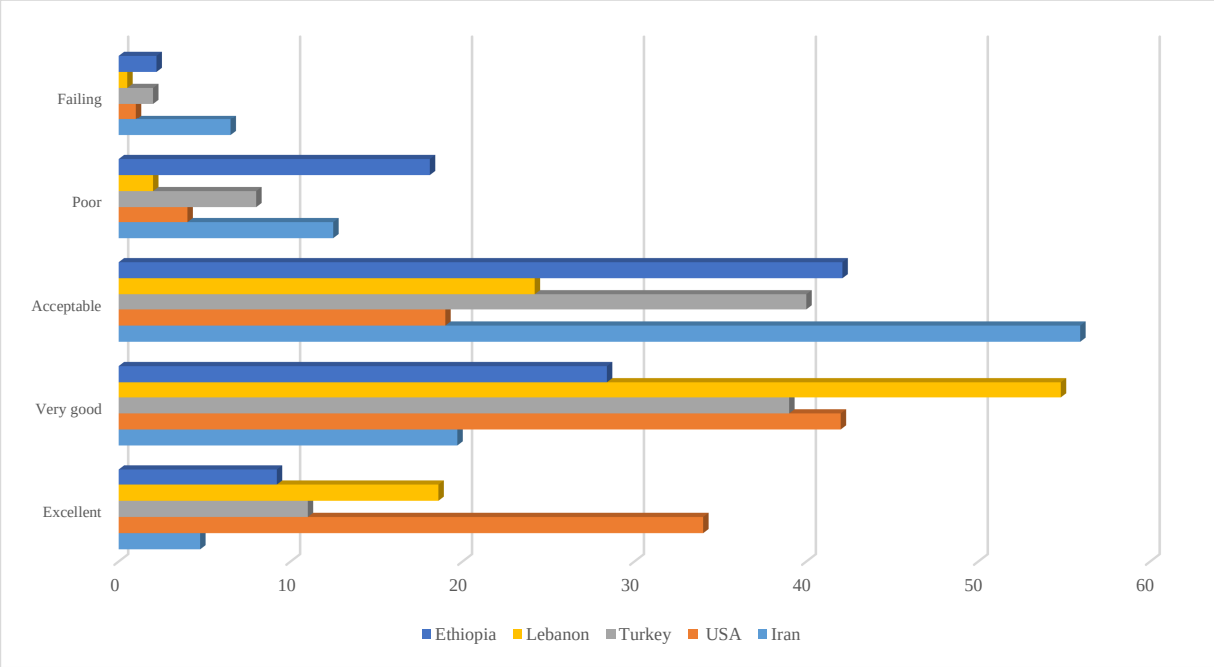


Figure 4. Comparison of mean PSC grade of Iran with other countries